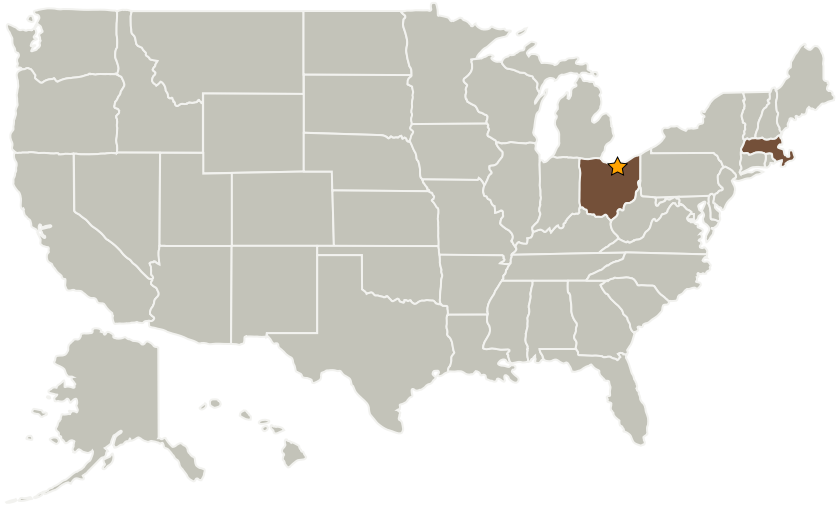
Novel Anodes for Rapid Recharge High Energy Density Lithium-ion Batteries, Phase I

Completed Technology Project (2008 - 2008)

Project Introduction

TIAX proposes to develop as a novel negative electrode active material for rechargeable lithium-ion batteries. This material will fill the gap between the state-of-the-art high energy density (e.g. graphitic carbon or amorphous tin-carbon composite) and high charging rate capability (e.g. nano-Li4Ti5O12) anode materials. The novel anode material will have specific capacity of 625 mAh/g and electrochemical potential of ~0.9 V vs. Li, making it capable of meeting NASA battery energy target of 180 Wh/kg. The mechanism of its electrochemical cycling will be by zero-strain topotactic lithiation/delithiation, making it capable of meeting NASA's requirements for cycle life and for rapid recharge capability. This novel anode material will provide for lithium-ion batteries having enhanced safety by virtue of its being non-toxic and having low thermal reactivity. Furthermore, the use of this novel anode chemistry will enable the implementation of other lithium-ion battery system enhancements, such as improved electrolytes. The Phase I program will demonstrate synthesis of the targeted material composition in the desired structure, and will demonstrate electrochemical performance of that material. Correlations between physical, structural and electrochemical properties of this novel anode material will be investigated through the course the program.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
TIAX LLC	Supporting Organization	Industry	Lexington, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Muharrem Kunduraci

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines